



(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
14.07.1999 Bulletin 1999/28

(51) Int Cl.6: **G11C 11/403**

(43) Date of publication A2:
18.11.1998 Bulletin 1998/47

(21) Application number: **98303663.3**

(22) Date of filing: **11.05.1998**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: **Artiere, Alain**
Mission Viejo California 27692 (US)

(74) Representative: **Palmer, Roger et al**
PAGE, WHITE & FARRER
54 Doughty Street
London WC1N 2LS (GB)

(30) Priority: **15.05.1997 US 856972**

(71) Applicant: **STMicroelectronics, Inc.**
Carrollton Texas 75006-5039 (US)

(54) **Multiple transistor dynamic random access memory array architecture with simultaneous refresh of multiple memory cells during a read operation**

(57) A four transistor dynamic memory cell architecture and refresh technique which allows for cell refresh to occur during a read operation. The access and memory transistors of the individual memory cells are fabricated with a relative width-to-length ratio such that it is sufficient to merely activate the associated word line to

perform the refresh operation. This is accomplished without activating the read sense amplifier resulting in lower power consumption and the retention of most recently read data. Multiple word lines may be activated concurrently utilizing the technique disclosed to further reduce the refresh rate overhead in a memory array and increase the overall memory array bandwidth.

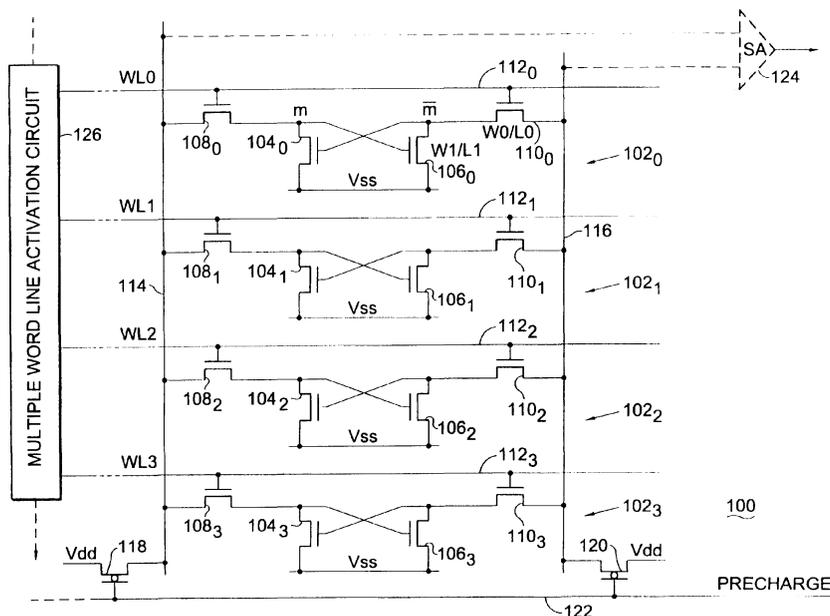


FIG. 3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 30 3663

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 5 020 028 A (WANLASS FRANK) 28 May 1991 * column 5, line 59 - column 6, line 2; figures 3,4 *	1-4	G11C11/403
Y		5-15	
A		16-18	
X	--- US 4 086 662 A (ITOH KIYOO) 25 April 1978	6	
Y	* figure 20 *	5-15	
A	--- US 5 475 633 A (MEHALEL MOTY) 12 December 1995 * figures 3-5 *	3,4,14, 15	

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			G11C
Place of search	Date of completion of the search	Examiner	
THE HAGUE	20 May 1999	Vidal Verdu, J.	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 30 3663

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-05-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5020028 A	28-05-1991	CA 2012668 A	07-02-1991
		DE 4014228 A	14-02-1991
		FR 2650694 A	08-02-1991
		GB 2234873 A,B	13-02-1991
		IT 1245983 B	07-11-1994
		JP 4082080 A	16-03-1992
US 4086662 A	25-04-1978	JP 1188317 C	30-01-1984
		JP 52091335 A	01-08-1977
		JP 58018714 B	14-04-1983
		JP 1178084 C	30-11-1983
		JP 52057741 A	12-05-1977
		JP 58011103 B	01-03-1983
		DE 2650574 A	12-05-1977
		GB 1535250 A	13-12-1978
		NL 7612301 A	10-05-1977
US 5475633 A	12-12-1995	AU 2654795 A	21-12-1995
		BR 9507827 A	16-09-1997
		CN 1149926 A	14-05-1997
		DE 19580583 T	22-05-1997
		JP 10501363 T	03-02-1998
		WO 9533265 A	07-12-1995

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82